*Oxygen Exchange Kinetics and Nonstoichiometry of Pristine La0.6Sr0.4CoO3−δ Thin Films Unaltered by Degradation*

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The mixed conducting perovskite material La0.6Sr0.4CoO3−δ (LSC) is a promising cathode material for application in a solid oxide fuel cell (SOFC) due to its catalytic properties for the oxygen surface exchange reaction and its high electronic conductivity. However, one of the obstacles in the use of LSC is its susceptibility to surface changes due to environmental factors. To deepen the understanding of these degradation mechanisms, it is necessary to retrace the properties and the structure of LSC to a point before degradation starts.

LSC thin films grown on YSZ single crystals were investigated directly in the stage of deposition by means of In-Situ Impedance Spectroscopy during Pulsed Laser Deposition (IPLD). This method allows the investigation of dense films unaltered by degradation and provides information about the oxygen exchange kinetics as well as the defect chemistry of pristine LSC thin films.

Our measurements revealed very low surface resistance values (1.3 Ωcm² at 600 °C and 0.04 mbar O2) compared to ex situ measurements (20 Ωcm² at 600 °C and 0.04 mbar O2). Also, the activation energy of the surface exchange resistance at 0.04 mbar O2 is significantly lower than at ambient conditions (1 vs. 1.3 eV) and the surface degrades slower. Mechanic reasons for these highly active surfaces as well as the influence of columnar grain size are discussed.

1 Z. Cai et al. *Chemical Heterogeneities on La0.6Sr0.4CoO3−δ Thin Films Correlations to Cathode Surface Activity and Stability*. Chemistry of Materials 24.6 (2012), pp. 1116-1127.

2 G. M. Rupp et al. *Real-time impedance monitoring of oxygen reduction during surface modification of thin film cathodes*. Nature Materials 16.6 (2017), p. 640.